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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Yuanqiao Rao, et al

IMAGING MATERIAL WITH
IMPROVED MECHANICAL
PROPERTIES

Serial No. 10/633,904

Filed 04 August 2003

Commissioner for Patents
P.O. Box 1450
Alexandria, VA. 22313-1450

Sir:

Group Art Unit: 1752

Examiner: Thorl Chea

I hereby certify that this correspondence was sent
by facsimile transmission to the United States
Patent and Trademark Office on the date set forth
below.

Christine Polburn
Christine Polburn

February 28, 2005
Date

DECLARATION PURSUANT TO 37 C.F.R. 1.131

I, Yuanqiao Rao and Robert J. Kress, state that we are joint inventors of the claimed subject matter of the above-referenced patent application, hereinafter referred to as the invention.

We have read and are familiar with Rao et al U.S. Patent 6,667,148, issued Dec. 23, 2003, based on U.S. Serial No. 10/341,747, filed Jan. 14, 2003, cited by the Examiner.

Prior to Jan. 14, 2003, and at the time the invention occurred, we were each employees of the Eastman Kodak Company in Rochester, New York.

Before Jan. 14, 2003, we conceived of and actually reduced to practice the claimed invention. This is demonstrated by the submission of contemporaneous records relating to the preparation and physical evaluation of the nanocomposite-containing layers in Examples S1-S8, spanning pages 23 to 27 of the specification of the above-referenced patent application.

Exhibit A is a contemporaneous record of the list of samples tested for scratch resistance, which is disclosed in the above-referenced patent application at pages 26 and 27.

Exhibit B is a contemporaneous record of the scratch test results on the list of samples included in Exhibit A and disclosed in the above-referenced patent application at pages 26 and 27, Table 5, and visually disclosed in Figs. 1-4.

Exhibit C is a contemporaneous record of the preparation of the samples for scratch testing listed in Exhibit A and disclosed in the above-referenced patent application at pages 26 and 27, Table 5.

Exhibit D is a contemporaneous record of the mechanical properties of the samples S1-S8 disclosed in the above-referenced patent application at pages 25 and 26, Table 3.

Exhibit E is a contemporaneous record of the mechanical test data for Young's Modulus and Break Strength of the samples S1-S8 disclosed in the above-referenced patent application at pages 25 and 26, Table 3.

Exhibit F is a contemporaneous record of the preparation of the samples for evaluation of mechanical properties disclosed in the above-referenced patent application at pages 25 and 26, Table 3.

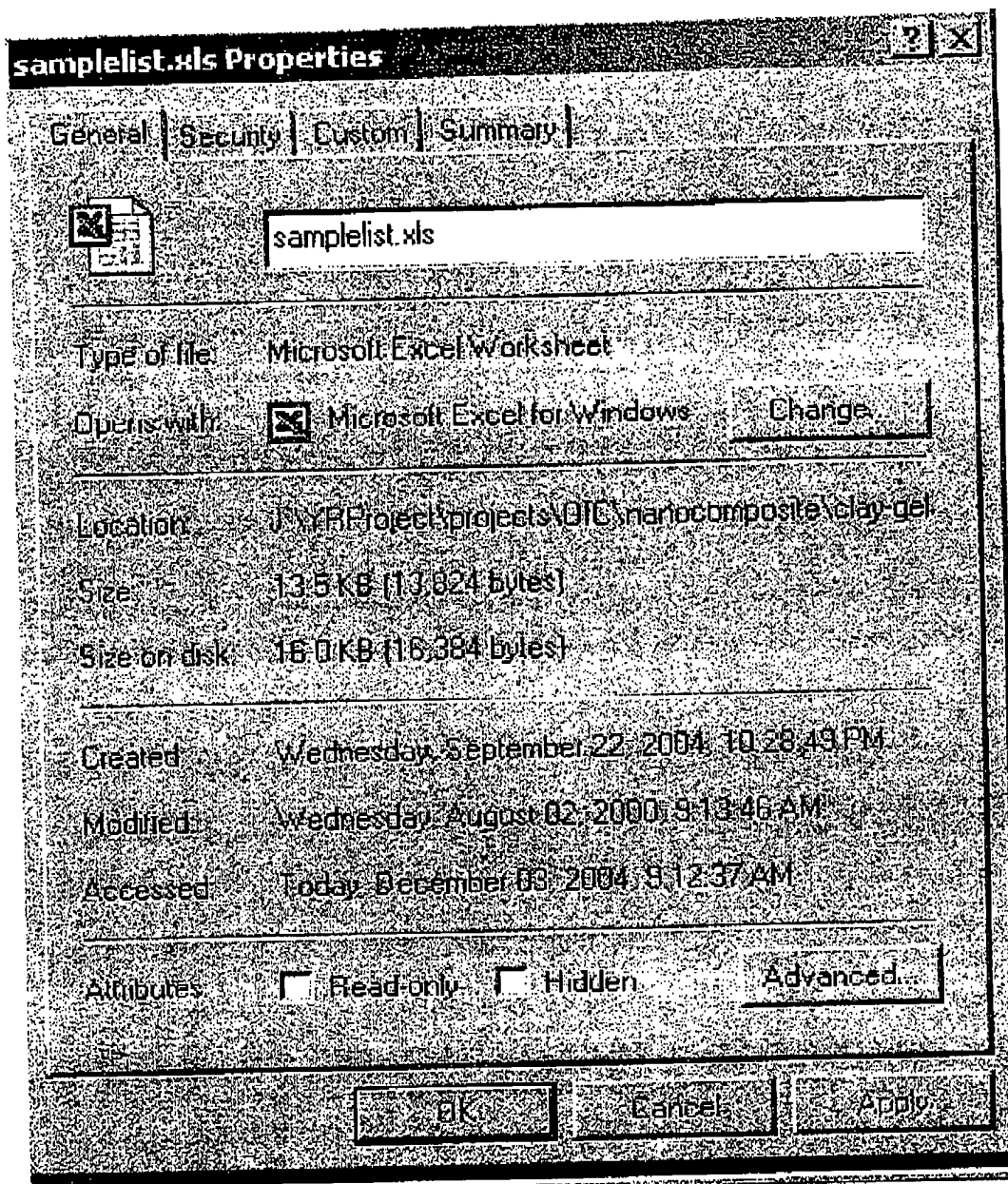
We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: February 28, 2005

Yuanqiao Rao
Yuanqiao Rao

Date: February 28, 2005

Robert J. Kress
Robert J. Kress



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EXHIBIT A

page 1 of 2 pages

10/633,904

Sample list for scratch resistance

ID	Composition	Coating thickness mil
gel-7-7-2	pure gelatin	.35-1.15
5cloisitegel-7-7-b-5	5:95/cloisite:gelatin	.55-.7
5laponitegel-7-7-lc-6	5:95/laponite:gelatin	.25-1.55
10cloisitegel-7-7-b-9	10:90/cloisite:gelatin	.25-.8

Excel file dated 8/2/2000

Filename: sample list.xls

Directory: project / 01C / nanocomposite / clay-gelatin / scratch

file property print out

EXHIBIT A

page 2 of 2 pages
10/633,904

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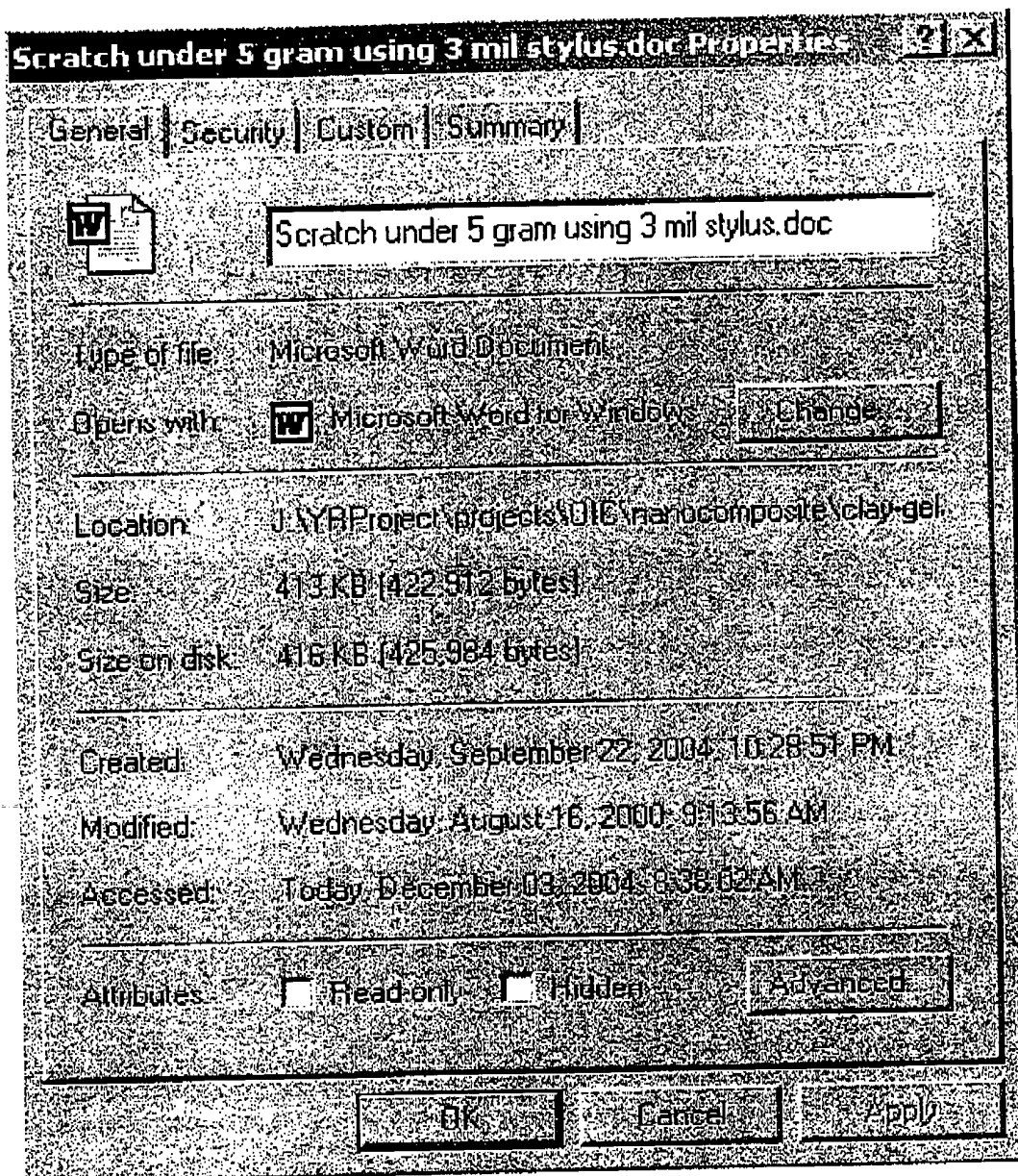
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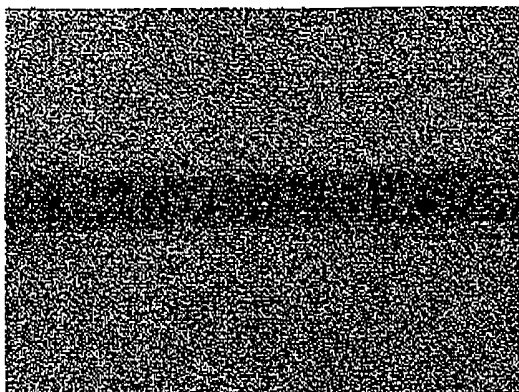
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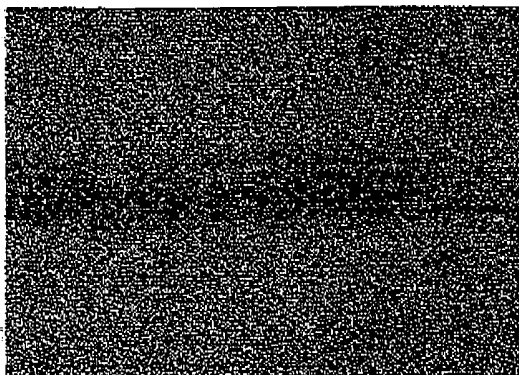


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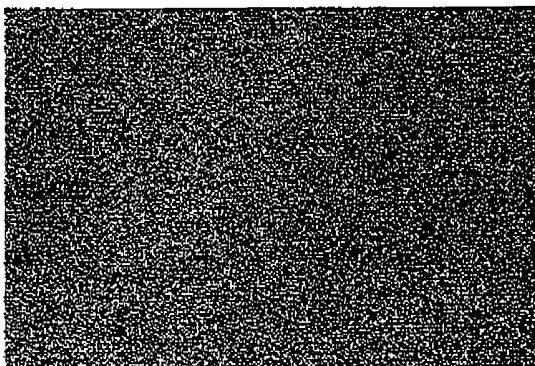
EXHIBIT B
page 1 of 3 pages
10/633,904



Scratch of a gelatin film under 5 gram using 3 mil stylus



Scratch of a 5:95/laponite:gelatin film under 5 gram using 3 mil stylus

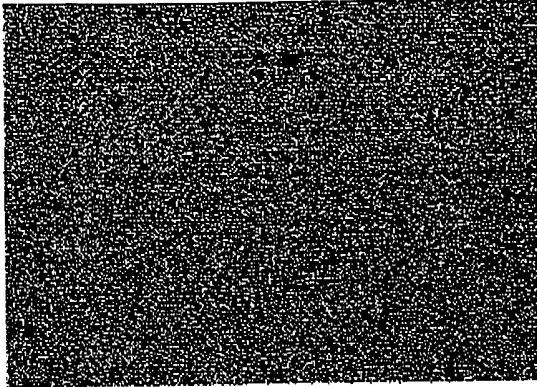


Scratch of a 5:95/cloisite:gelatin film under 5 gram using 3 mil stylus

EXHIBIT B

page 2 of 3 pages

10/633,904



Scratch of a 10:90/cloisite:gelatin film under 5 gram using 3 mil stylus

Excel File dated 8/16/2000

File name: scratch under 5 gram using 3 mil stylus .doc

Directory: project 101C / nanocomposite / clay - gelatin / scratch /
pictures

EXHIBIT B

page 3 of 3 pages
10/633,904

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PAGE

80

Notebook No.

BB 92 83

RESEARCH / DEVELOPMENT

EASTMAN KODAK COMPANY

Date 6-29-00, 7-7-00

Problem: Gelatin - clay (Sample)

11. 5 (disileg) 1627 A2-1 uniform.

(1) T = 0.75 mil

(2) T = 0.6 mil E.F

(3) T = 0.65 mil

(4) T = 0.7 mil

 $E = 579121 \text{ psi}$ $\sigma = 14105$ $\epsilon = 8.8\%$ $T = 92.6 (32.4)$

(45951)

(904)

(2.4)

psi

May. 1597

11.4

130.7

7-7-00

10:30 AM

Weigh Gelatin (30-122) 20 g

+ 480 g water Deion

→ 4% gel sln

10:50 AM

Put in 50°C water bath mixing (lightening mixing)

→ 11:10 AM

11:00 AM

Weigh Nanocor PEU (PV-114-98)

10.17 g

11:40 AM

→ + 240 g Deion water (slumps first) RM mixing

11:20 AM

Weigh SCP (GyponiteTM (13439-6/244) 10.19 g

+ 240 g Deion water. Brownish slurry

Put into 50°C bath, Lightening mixing

(translucent mixture)

First stir water to form vortex, then add in clay

11:40 AM

Take 5g 4% disileg 6-14-00

5.05g + 45g warm Deion water (50°C)

EXHIBIT C

page 1 of 6 pages

10/633,904

KP 15226-5/98 L.P.S.

Signature

RESEARCH / DEVELOPMENT

EASTMAN KODAK COMPANY

Notebook No. **BB 92 83**

PAGE

81

Date 7-7-00ohlem: 7-7-00 Gelatin - clay

12:00pm add 95 g gelatin 4% to 7-7-00 (50°C)

40mA stir, small blade, ~50°C (Teflon container)
(No bubble)12:10pm Weigh 10.06g cloisite ~~ex~~ - 6-14-00

+ 44.3 g Deion (90°C) water

Weigh 90 g 5% gelatin 7-7-00

0.5 Krpm, (PC 100 ml container)
(center bubble)

1:30pm Stop the 5% cloisite mixture (Temp. approaches 60°C)

Weigh: total weight = 224.57g Some bubbles

- O.W 108.04g after weighing - no bubble

Knife: 40mil

116.48g

seen

1:40pm Weigh 5g Laponite RDP - 7-7 (4%) $C = 3.4\%$

+ 42.28g Deion Water (55°C) Put in 55°C Cowlas Mixer

1:50pm Weigh 95g 4% Gelatin

40 mA

Add to Laponite mixture

1:55pm S cloisite gel - 7-7-B-1

130°F cooking, set time 1 min, Chill set 10S after reaching

low Temp. It's flowable during transportation.
(50°F)

2:00 pm S cloisite gel - 7-7-B-2

120°F cooking, set time 30S, Chill set 10S

Not flowable as the previous one

2:05 pm T cloisite gel - 7-7-B-3

110°F cooking, set time 1 min, Chill set 10S

Very flowable (compared to previous two, spill some)

EXHIBIT C

page 2 of 6 pages

10/633,904

Signature [Signature]The foregoing disclosed to me on 7/1/00

AGE

12

Notebook No.

BB9283

RESEARCH / DEVELOPMENT

EASTMAN KODAK COMPANY

Date 7-7-00

Problem: Gelatin - Clay

2:12pm. 5 Cloisite gel - 7-7-B-5.

120°F. on Uncoated PET. 1min set time 10s chill set
flowable (~2-3)

2:15pm 5 Cloisite gel - 7-7-B-4

120°F. on Bare PET. 5min set time 10s chill set
not flowable

2:30pm. Move Newware PGR to 50°C Bath

! Need to check the total weight to make sure
it's not contaminated by water.

2:30pm. Took 10 Cloisite gel mixture out.

top soaps. total weight = 148.42g
- container weight = 26.17g
124.3g

2:40pm. 10 Cloisite gel - 7-7-B-8

120°F. on Bare PET. 1min set time 10s chill set
flowable, TABLE FLAT

2:40pm. 10 Cloisite gel - 7-7-B-9

on Uncoated PET. 120°F. 1min set time 10s chill set
TABLE FLAT

2:50pm. gel - 7-7-1

4% gelatin sl. 120°F. 1min set time 10s chill set
on Bare PET flowable table flat

2:50pm. gel - 7-7-2

4% gelatin sl. on Uncoated PET. 120°F. 1min set time 10s chill set
very flowable. spill a little glass flat

2:50pm. gel - 7-7-3

EXHIBIT C

page 3 of 6 pages

10/633,904

225-588 L.P.S.

Signature

RESEARCH / DEVELOPMENT

BB 92 83

PAGE

83

EASTMAN KODAK COMPANY

Notebook No.

Date

7-7-00

sm:

Gelatin - Clay

4% gel sln., on U-coated PET. 120°F. No set, chill set 5min. (46°F)

* (No moisture condensation → Room RH is low?)

ON TABLE TILT

los chill set equals to No chill set. Because timer starts when the
water temp reached 50°F. while plate temp is still pretty high.

3:25pm: gel-7-7-4

4% gel sln. on bare PET. 120°F. No set. chill set 5min (46°F)
on table tilt

3:30pm: gel-7-7-5

4% gel sln. on bare PET. 120°F. No set. chill set 10min
on table tilt.

STILL NO CONDENSATION

4:05pm: STOPPED. 5 Laponite gel mixture. No bubble. clear:

total weight: 224.80g

- C.W. 108.09g

116.7g

4:05pm: pet-7-7-6

4% gel sln. on U coated PET. 120°F. No set. chill set 10min.
on table tilt, no moisture condensation

* Big difference in Room RH

4:20pm:

5 Laponite-7-7-LC-07

120°F. 1min set time. chill set 105. on bare PET.

4:25pm:

5 Laponite-7-7-LC-6

120°F. 1min. set time. chill set 105. on U coated PET

EXHIBIT C

page 4 of 6 pages

10/633,904

25/25 L.P.S.

PAGE

84 BB 92 83 RESEARCH / DEVELOPMENT

Notebook No.

EASTMAN KODAK COMPANY

Date 7-7-00

Problem: Gelatin - Clay

4:10pm 10 clozite gel-7-7-B-10

105°F coat and kept at 105°F.

5:30pm Stop Nanocore GPV dispersion (470)

Weight: 461.17g

C.W: 209.78g

252g

7-10-00

STORE ALL Gelatin-containing samples in Freezer (~ -15°C.)

7-13-00

Collect samples from 7-7 Gelatin - clozite film

Peel off: 1. 5 clozite gel-1-7-B-1

2. 5 clozite gel-2-7-B-2

transparent film

3. 5 clozite gel-2-7-B-3

4. 5 clozite gel-2-7-B-4

5. 5 clozite gel-7-7-B-5 on u coated PET.

(Some slr. was on the back side between PET and glass and very different to peel -> (break the film)

6. Slaponite gel-7-7-LC-6 on u coated PET
curved. ✓

7. Slaponite gel-7-7-LC-7

8. 10 clozite gel-7-7-B-8

9. 10 clozite gel-7-7-B-9 on u coated PET

10. 10 clozite gel-7-7-B-10

EXHIBIT C

page 5 of 6 pages

10/633,904

KP 16226-5/06 L.P.S.

Signature

RESEARCH / DEVELOPMENT
EASTMAN KODAK COMPANYNotebook No. **BB 9283**PAGE
85Date 7-13-00

Problem:

11. gel-7-7-1

12. gel-7-7-2 on alcoated PET
(some sh. in between glass and PET. difficult to tear)

13. gel-7-7-3

14. gel-7-7-4

15. gel-7-7-5

16. gel-7-7-6 on alcoated PET

5:00 PM

Samples were conditioned in a 50RH/70°F Room

1. gel-7-7-1

2. 10clo3ite-gel-7-7-B-9 (on PET)

3. 5clapontegel-7-7-LC-7

4. 5clo3itegel-7-7-B-5

5. 5clapontegel-7-7-B-3

6. 5clapontegel-7-7-LC-6

7. 10clo3itegel-7-7-B-8

8. 5clo3itegel-7-7-B-4

9. 5clo3itegel-7-7-B-1

EXHIBIT C

page 6 of 6 pages

10/633,904

PAGE

94

BB9288

RESEARCH / DEVELOPMENT

Notebook No.

EASTMAN KODAK COMPANY

Date

7-31-00

Problem:

Cloisite Gel - 7-7-B-2

↓ Chang grips

 $T_p = 0.7 \text{ mil}$

* Using point-flat surface clamp.

before using two flat faces.

 $E = 972269 \text{ psi}$ $\sigma = 15616$ $\epsilon = 3.1$

29.9

980907

15114

3.1

3.7

Gel-7-7-1

 $T \sim 1.2 \text{ mil}$ $E = 565100$ $\sigma = 14010$ $\epsilon = 12.4$

Toughness: 125.6

(71075)

(1056)

(6.7)

Cloisite Gel-7-7-B-4

1. ? TD

Toughness

 $E = 863498$ $\sigma = 14457$ $\epsilon = 4.9$

51.6

5 Cloisite Gel-6-7-7-B-4-2

1. TD

0.9 mil, 836434, 1470, 3%

0.8-1.0 mil

 $\tilde{E} = 818941$

14537

6.7

72.5

(48290)

(571)

(3.6)

(457)

whitening close to failure edge

EXHIBIT D

page 1 of 1 page

10/633,904

RESEARCH / DEVELOPMENT

EASTMAN KODAK COMPANY

BB 92 83

PAGE
61

Notebook No.

Date

6-7-00

Item:

Mechanical test of clay-gel

Add test to 5 cloisite gel high shear 1

3rd. 0.85 - 0.50 mil, Input $T = 0.5$ mil. failed inside grips

$$E = 1179337 \text{ psi}$$

$$E' = E \times 0.8 = 943470$$

Avg. $\sigma = 15660$, 2.3%. $E = 1220283$, toughness = 22.6

Test sample 3 cloisite gel high shear 1 (0.9)

avg. $T = 0.6$ mil, $W = 6.35$ mm, $\epsilon_b = 3.6\%$, $E = 680799$ psi (27603)

$$\sigma = 14122 \text{ psi (362)}, \text{ toughness} = 30.9 (10.6)$$

Sample 10 cloisite gel high shear. is hard to peel

Thickness measurement

bare film: 3.9 mil

3 ~ 0.6 - 0.1 mil thickness

with coating: 4.5 - 4.0

Test of bare PET. 0.189 mil ~ 4.8 mm.

Necking, $E = 559876$ $T: 0.65 - 0.35$ mil. Input 0.35 mil

$$E' = 1635583, E = E' \times 0.8 = 1308466 \text{ psi}$$

$$\sigma = 16076 \text{ psi}, \epsilon = 0.9\% \text{ (Gage Failure)}$$

(True)

6-8-00

Test 1% cloisite-gel, mechanical test

GL = 2.5", rate = 0.25 %/in, $W = 6.35$ mm, $T = 1.35$ mil

5 samples

$$E = 508508 \text{ psi}, \sigma = 14775 (425), \epsilon = 8.0\% (1.1) \text{ Toughness } \pm 70.4 (11.8) \\ (20698)$$

EXHIBIT E

page 1 of 3 pages

10/633,904

PAGE

68

BB 9283

RESEARCH / DEVELOPMENT

Notebook No.

EASTMAN KODAK COMPANY

Date

6-20-00

Problem:

Gelatin - Clay (Free Dry)

Pack Freeze-Dry Sample.

The sample is kind of flaky.

1. 10,000 RPM SEDIMENT (6-9-00)

~20.22g

2. 10,000 RPM LIQUID PART (6-9-00)

~6.89 g.

3. 3,000 RPM LIQUID (6-9-00)

(Not Dry enough).

The sample color is not very different from original color

9:15AM Put 2, 13, + residual from the 3000 RPM sediments - into a house vacuum oven, raise temp. to 40°C.

9-10AM Peel coating from substrate
good pencil and pen writability

Send Tom Blanton two samples for X-ray test

1. 5 do's of gel 615

2. 10 do's of gel 615

Mechanical Test

1. Gel 615 2. Edge fail 6. Edge fail

 $W = 1.5 \text{ mil}$, $W = 6.35 \text{ mm}$ Avg. $E = 436843 \text{ (psi)}$, $\epsilon = 9.1\%$, $\sigma_t = 12094 \text{ psi}$, $\sigma_y = 11970 \text{ psi}$
(12241) (1.1) (650) (789)

Toughness = 77.2 (11.6) ft-lb

EXHIBIT E

page 2 of 3 pages

10/633,904

KP 15226-5/86 1 P.S.

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RESEARCH / DEVELOPMENT

EASTMAN KODAK COMPANY

Notebook No.

BB9283 6

Date

6-27-00

Problem:

Gelatin - Clay (Mechanical Test & Sample Prep.)

2. 5 cloisite gel 615

Aug. 1.03 ml $E_b = 7.4\%$, $E = 67133$ psi, $\sigma_b = 13553$ psi, $\sigma_y = 13762$, $T = 71.3$
 (1.3) (1942) (631) (606) (12)

3. 10 cloisite gel 615 Brittle failure shear band, whitening

0.81 ml Aug. $E = 91804$ psi, $E_b = 6.3$, $\sigma_b = 14457$ psi, $\sigma_y = 15165$, $T = 67$
 (45997) (0.7) (378) (703) (76)

DSC Measurement:

(1) 10 cloisite gel 615-1 $w = 15.3$ mg(2) 5 cloisite gel 615-1 $w = 12.7$ mg(3) gel 615-1 $w = 17.0$ mg

6-27-00

Prepare Gelatin sln.

7:45 AM (16g gel + 384 g H₂O
 20g + 480 g H₂O)

7:50 AM Weight: 20.80g gel + 499.45g H₂O → 520g total
 → (2%) gel soln.

8:15 AM

Soak for 20 mins.

→ Put in 50°C water bath, Mixing using lightening mixer

Weight of small Teflon container: 4108.11 g

big — — : 320.48 g

Plastic container (400ml): 23.07g (w) plastic container (1000ml) 55.46g

200g total

10g cloisite dispersion (2%) + 190g gel (4%) sln. + 100g H₂O

After an hour, take 80g out

EXHIBIT E

page 3 of 3 pages

10/633,904

KP 15226-6/86 I.P.S.

Signature

PAGE

54

Notebook No.

BB 92 83

RESEARCH / DEVELOPMENT

Date

5-31-00

EASTMAN KODAK COMPANY

Problem:

Gelatin - clay

8:00AM (1). 4% (wt.) clay dispersion laponite RDS from 2 weeks ago

log clay + 240 g water

cloisite Na⁺ (slight yellow powder)

afterwards, it's like a slurry not transparent in lightening mixer

(2). 4% gelatin solution (30-102)

(3). 10% gelatin solution

(4). 0.5% clay + gelatin 1.4%

100 g mixture

5 g clay + 95 g gelatin

+ 50 g water (deionized)

weight of content: 108.09 g

total weight: W = 240 g

148 g

After ~30 mins. 131 g (129/30 min.)

Need ~90 mins. to evaporate 50 g water.

(5) 4% gelatin, 16 g gel + 384 g H₂O

Final weight: 211.73 g - 108.09 g = 103 g

Have mixed under high shear for 2.5 hrs

Clear solution

After 2 hrs. the cloisite dispersion seems well dispersed

while it's not transparent and has yellow color

! Maybe OK for small amount of addition in gelatin

Took off it from lightening mixer and put in
3" stir bar for overnight

EXHIBIT F

page 1 of 1 page

10/633,904

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